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Herpestes sanguineus.

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Herpestes sanguineus Rüppell, 1835

Slender or Black-tipped Mongoose

Herpestes sanguineus Rüppell, 1835:27, pl. 8, fig. 1, pl. 10, fig. 3. Type locality "Kordofan."

Herpestes gracilis Rüppell, 1835:29, pl. 8, fig. 2, pl. 10, fig. 2. Type locality "Westlich von Massaue an der abyssinischer Küste."

Herpestes mutgigella Rüppell, 1835:29, pl. 9, fig. 1. Type locality Dembea and Simen districts, Abyssinia.

Herpestes fuscus Rüppell, 1835:31, footnote, pl. 10, fig. 4 (skull). Type locality same as *mutgigella*, name given inadvertently to the dark phase.

Cynictis melanura Martin, 1836:56. Type locality Sierra Leone.

Ichneumon cauui A. Smith, 1836:42. Type locality Kurrichane, northwestern Transvaal.

Ichneumon ratlamuchi A. Smith, 1836:42. Type locality "Between Latakoo and the Tropic," South Africa.

Herpestes badius A. Smith, 1838: pl. 4 and text. Type locality between Old Latakoo and Kurrichane, 120 miles eastward, Transvaal, South Africa.

Ichneumia nigricaudatus I. Geoffroy St.-Hilaire, 1839:18. Renaming of *gracilis* Rüppell.

Herpestes galinieri Guérin, 1847:169, atlas, zool., pl. 1, fig. 1. Type locality Ethiopia.

Herpestes punctulatus Gray, 1849:11. Type locality Port Natal, South Africa [= Durban, Natal].

Herpestes ochraceus Gray, 1849:138. Type locality Abyssinia.

Herpestes lefebvrii Prévost and Desmurs, 1850: atlas, zool., pl. 1, fig. 1, index. Type locality Abyssinia.

Herpestes ornatus Peters, 1852:81. Type locality "Africa orient, Tette, 17° Lat. Austr," Mozambique.

Herpestes ochromelas Pucheran, 1855:393. Renaming of *gracilis* Rüppell.

Herpestes jodoprymnus Heuglin, 1861:no. 8, p. 23. Type locality eastern Abyssinia.

Calogale grantii Gray, 1865:561. Type locality Mgunda Mkali, Tanganyika Territory.

Calogale venatica Gray, 1865:563. Type locality "East Africa."

Herpestes ruficauda Heuglin, 1877:43. Type locality Highlands of Wolo-Gala, Abyssinia, 12,000 ft.

Herpestes neumanni Matschie, 1894:121. Type locality Tisso, northern Ugogo, Tanganyika Territory.

Herpestes bocagei Thomas and Wroughton, 1905:170. Type locality Caconda, Benguella, Angola.

Mungos auratus Thomas and Wroughton, 1908:543. Type locality Tette, Mozambique.

Mungos phoenicurus Thomas, 1912:280. Type locality Panyam, Bauchi Province, northern Nigeria.

Mungos dentifer Heller, 1913:10. Type locality Maji-ya-Chumvi, Kenya Colony.

Mungos ignitus Roberts, 1913:76. Type locality Malava, Boror, Mozambique.

Calogale marae Matschie, 1914:453. Type locality on the Ngare Mbusse, a southern tributary of the Ngare Dobasch (Mara), between Lake Natron and Lake Victoria, Tanganyika Territory.

Calogale elegans Matschie, 1914:456. Type locality Kikuyu (Fort Smith), Kenya Colony.

CONTEXT AND CONTENT. Order Carnivora, Family Viverridae, Subfamily Herpestinae. The genus includes at least 13 species in the Ethiopian, Oriental, and Palaearctic regions. Different authors recognize different numbers of species and subspecies (Allen, 1939; Roberts, 1951). The subspecies listed below and their groupings are based on Coetzee (1967).

sanguineus section, northeastern Africa

H. s. sanguineus Rüppell, 1835:27, see above.

H. s. gracilis Rüppell, 1835:29, see above (*nigricaudatus* I. Geoffroy St.-Hilaire, *galinieri* Guérin, *lefebvrii* Prévost and Desmurs, *ochromelas* Pucheran, *jodoprymnus* Heuglin, and *ruficauda* Heuglin are synonyms).

H. s. mutgigella Rüppell, 1835:29, see above (*fuscus* Rüppell a synonym).

H. s. proteus (Thomas, 1907:119), type locality "Ruwenzori East," 7000 ft.

H. s. ugandae (Wroughton, 1909:514), type locality Entebbe, Uganda.

H. s. ibeae (Wroughton, 1907:118), type locality Kikuyu, Kenya Colony (*elegans* Matschie and *marae* Matschie are synonyms).

H. s. orestes (Heller, 1911:15), type locality west slope of Mt. Kenya, Kenya Colony, 8500 ft.

H. s. rendilis (Lönnberg, 1912:66), type locality "thornbush country north of Guaso Nyiri," Kenya.

H. s. parvipes (Hollister, 1916:5), type locality "Kaimosi," Kenya.

H. s. dentifer (Heller, 1913:10), see above.

H. s. rufescens Lorenz, 1898:462, type locality Island of Zanzibar.

sanguineus section, southern Africa

H. s. flavescens Bocage, 1889:179, type locality Benguella, Angola.

H. s. bocagei Thomas and Wroughton, 1905:170, see above.

H. s. cauui (A. Smith, 1836:42), see above (*venatica* Gray a synonym).

H. s. punctulatus Gray, 1849:11, see above.

H. s. ornatus Peters, 1852:81, see above (*zombae* Wroughton a synonym).

H. s. swinnyi (Roberts, 1913:75), type locality "Nggeleni District" Pondoland, Cape of Good Hope.

H. s. swalius Thomas, 1926:292, type locality "Great Brukaros Mountain, Great Namaqualand, Southwest Africa, 3500 ft.

H. s. caldatus Thomas, 1927:374, type locality "Sandfontein" Gobabis-Bechuanaland Border, Southwest Africa.

H. s. kalaharicus (Roberts, 1932:2), type locality Gemsbok Pan, Bechuanaland, South Africa.

H. s. kaokoensis (Roberts, 1932:2), type locality Okorosave, Kaokoveld, Southwest Africa.

H. s. bradfieldi (Roberts, 1932:2), type locality Quickborn Farm, 60 miles north of Okahandja, Southwest Africa.

H. s. okavangensis (Roberts, 1932:3), type locality Karakuwise, Grootfontein District, Southwest Africa.

H. s. khanensis (Roberts, 1932:3), type locality Khan Mountains, east of Swakopmund, Southwest Africa.

H. s. ngamiensis (Roberts, 1932:3), type locality Maun, Ngamiland, Bechuanaland, South Africa.

H. s. dasilvai Roberts, 1938:235, type locality Ondjiwa, Southern Angola.

H. s. lancasteri (Roberts, 1932:4), type locality Kafue River, Northern Rhodesia.

sanguineus section, western Africa

H. s. melanurus (Martin, 1836:56), see above.

H. s. canus (Wroughton, 1907:114), type locality Cape Verde.

H. s. phoenicurus (Thomas, 1912:280), see above.

H. s. mustela (Schwarz, 1935:300), type locality Efulen, Ebolowa District, southern Cameroons.

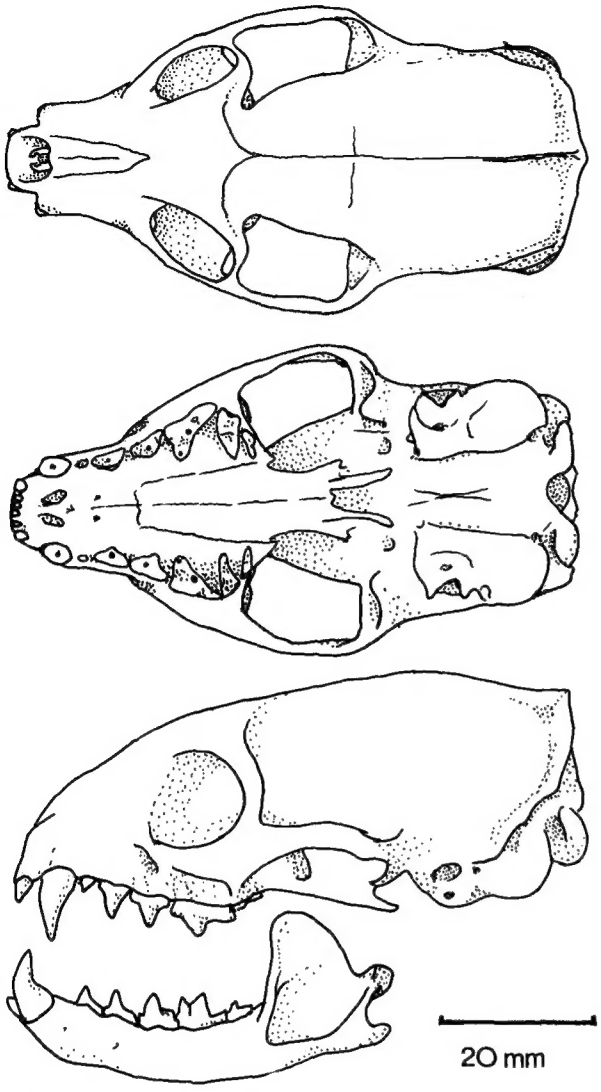

FIGURE 1. Skull of *Herpestes sanguineus*. From top to bottom: dorsal view, ventral view, lateral view, and lateral view of lower jaw. Modified from Allen (1924) using a male East African specimen (Royal Ontario Museum no. 67756).

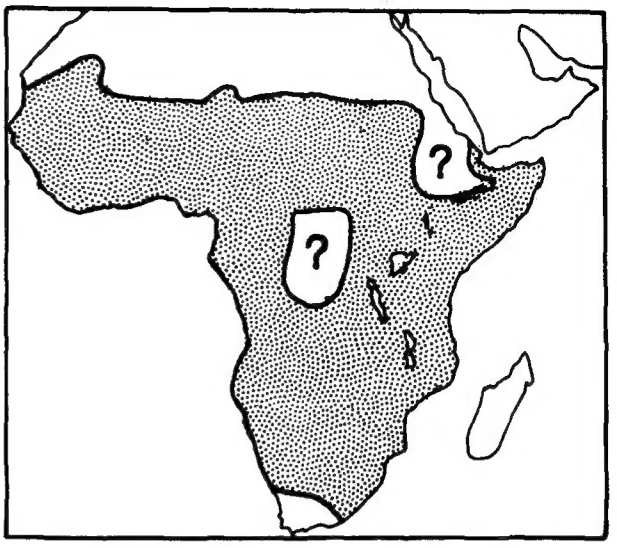

FIGURE 2. Map showing the distribution of *Herpestes sanguineus*.

***ratlamuchi* section**

H. s. ratlamuchi (A. Smith, 1836:42), see above.

H. s. upingtoni (Shortridge, 1934:124), type locality between Upington and Louisvale, Orange River.

H. s. auratus (Thomas and Wroughton, 1908:543), see above.

H. s. ignitus (Roberts, 1913:76), see above.

H. s. ignitoides (Roberts, 1932:2), type locality Macequece, Mozambique.

H. s. grantii (Gray, 1865:561), see above.

H. s. galbus (Wroughton, 1909:514), type locality Mubende, Uganda.

H. s. ochraceus Gray, 1849:138, see above.

H. s. perfulvidus Thomas, 1904:96, type locality Wardair, NW of Gerlogobi, central Somaliland.

H. s. fulvidior Thomas, 1904:97, type locality Mandeira, S of Berbera, Somaliland, 3500 ft.

H. s. saharae Thomas, 1925:189, type locality Aouderas, Asben, French Equatorial Africa.

DIAGNOSIS. *Herpestes sanguineus* is a small, slight, pan-African viverrid, usually reddish or yellowish, in fewer cases a dark brown, with a black tip on the tail. It differs from *H. pulverulentus* of South Africa, which is slightly larger, generally gray or blackish, and lacks a black tail tip. Basic measurements for *H. sanguineus* are: head and body length 275 to 400 mm; tail length 230 to 330 mm; weight 0.35 to 0.9 kg (Roberts, 1951; Taylor, 1970). *Herpestes ichneumon* and *H. naso* are both much larger: head and body length about 500 to 650 mm (de Winton, 1901; Dorst and Dandelot, 1970) and weight 2 to 3 kg. Other small mongooses with which *H. sanguineus* might be confused are species of *Helogale*, *Cynictis penicillatis*, and *Paracynictis selousi*. *Helogale* is smaller (head and body length 280 mm), gregarious, and diurnal, has a uniform sandy pelage and a relatively short tail (180 mm) that lacks a black tip. Both *Cynictis* and *Paracynictis* are of a general yellowish color. *Cynictis* has a head and body length of about 300 mm, *Paracynictis* about 400 mm. *H. sanguineus* has five toes on both fore and hind feet, whereas *Paracynictis* has four toes on both fore and hind feet; *Cynictis* has four toes on the forefeet and five on the hind feet. Dentition of *H. sanguineus* is i 3/3, c 1/1, p 4/3, m 2/2, total 38 (figure 1). Most other *Herpestes* species have four lower premolars and a total of 40 teeth.

GENERAL CHARACTERS. The pelage is quite variable in color, melanistic and erythristic specimens occur. General color is yellowish or reddish brown as seen at a distance. The pelage is grizzled, each hair being ringed with black and buffy brown. Underparts are buff. The tail is long, slender, and furry, and has a conspicuous black tassel at its tip (Dorst and Dandelot, 1970). Each foot has five toes (figure 3), the first is extremely small and does not make an impression in the animal's footprint. The claws of the forefeet are curved and sharp. The sole of the hind foot is partly naked (Smithers, 1966; Pocock, 1916; Taylor 1971*b*). General body size is given in the diagnosis and detailed measurements may be found elsewhere (Heller, 1911, 1913; Hollister, 1916; Lönnberg, 1912; Roberts, 1951; Rüppell, 1835; Schwarz, 1935; Smithers, 1971; Taylor, 1970, 1971*b*; and Thomas, 1903, 1908, 1912, 1925, 1926, 1927, 1928). Males are about nine per cent larger than females (Taylor, 1971*b*). Small glands are found on either side of the anus (Rüppell, 1835) that produce a slightly musky smell, probably used in marking territory. The tympanic bullae are flattened posteriorly and well developed anteriorly, whereas in *Herpestes ichneumon* only the posterior part is well developed and projects downward considerably. Mammae normally are in two abdominal pairs (Roberts, 1951).

DISTRIBUTION. The species is found throughout most of Africa south of the Sahara (figure 2). The distributions of subspecies are quite vague.

There is no fossil record of *H. sanguineus* to date. Material of the genus described from the Tertiary of Europe (Kurten, 1968) is probably *H. ichneumon*, judging from its present distribution (Van den Brink, 1967).

FORM. Upper parts of the animal are grizzled, the hair is broadly annulated with buffish white, or ochraceous with dark brown to blackish rings. The dark rings are broader than the pale rings. The annulation of the hair tends to produce somewhat wavy, blackish, transverse stripes about 2 mm wide,

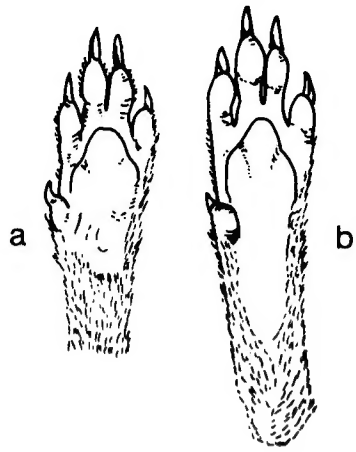

FIGURE 3. Forefoot (a) and hind foot (b) of *Herpestes sanguineus*, after Allen (1924).

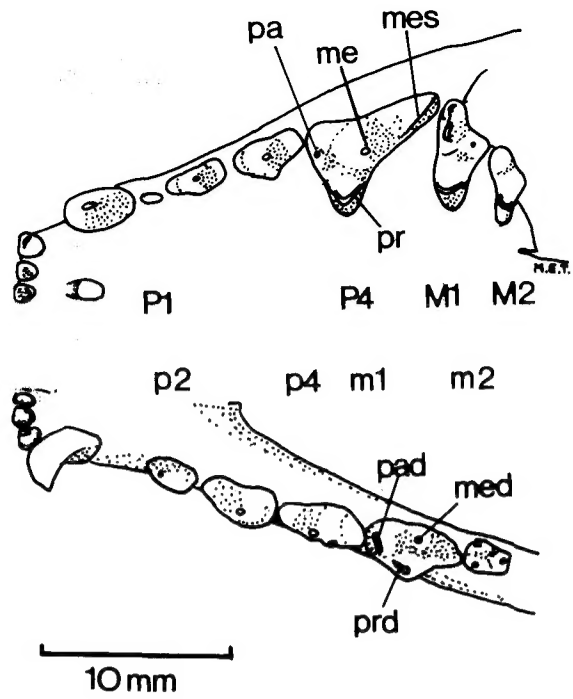

FIGURE 4. Dentition of *Herpestes sanguineus*, occlusal view of left upper jaw (top) and occlusal view of left lower jaw (bottom). Drawn by the author from a male specimen (Royal Ontario Museum no. 67756). Some teeth and their parts are labelled with abbreviations that are noted in text.

on the posterior two-thirds of the body, sometimes as far forward as the shoulders. The hairs are about 13 to 15 mm long on the anterior part of the back and 15 to 17 mm posteriorly. Individual hairs generally have six rings alternating pale and dark, the base being pale and the tip dark. The head is more finely grizzled, and the tail more coarsely so. Caudal hairs have four or five pale rings, the last of which often reaches the tip. The legs are grizzled, but the digits are more or less a uniform buff. The ventral pelage is more variable and may be grizzled or relatively uniformly buff. The length of the black tip on the tail varies from 70 to 130 mm. The hair of the tail is from 30 to 40 mm long (modified from Lönnberg, 1912). The color of the pelage may be highly variable at a single locality (see section on Ecology). Details on colors may be found in Roberts (1951). Due to the mentioned variation, the description by Lönnberg appears to be the most generally applicable.

The feet (figure 3) are small, the sides are furred for nearly the proximal half, the pollex and hallux are greatly reduced (modified from Allen, 1924). The upper incisors are small and increase in size laterally so that the occlusal surface of the third is about twice as large as that of the first (figure 2). The upper canines are slightly recurved, have a distinct cingulum, and are slightly keeled posteriorly. P1 has a single root, is small and roughly conical, and its occlusal surface faces posteromedially. P2 has two roots, is about twice as high as P1, and has the cusp about midway between the anterior and posterior margins. P3 has a slight medial heel. P4 is large and has three distinct roots; it is broad anteriorly and tapers posteriorly to the metastyle (mes), a sharp blade-like extension of the metacone (me); the protocone (pr) is reduced to about the same height as the paracone (pa); the metacone is the largest cusp. The first molar is a narrow tooth, the paracone is high and at the same level as the posterior part of P4, the protocone is low and at the same height as that of P4, and the metacone is reduced to a small cusp. M2 is small, the protocone being the major component. The lower incisors are smaller than the uppers; i1 and i2 have a single cutting surface, whereas i3 has a complex one when worn. The canines are curved and flare outward, the cingulum being most pronounced on the posteromedial surface. The three lower premolars (p1 is absent) reach approximately the same height and have a similar profile, although p4 has a small talonid posteriorly. The first lower molar is large and has well-developed protoconid (prd), paraconid (pad) and metaconid (med), and a low flat talonid; m2 is small, slightly larger than the talonid of m1, the paraconid being the largest cusp (the protoconid and metaconid are smaller). See Figure 4. Petter (1969) discussed the evolutionary significance of viverrid dentition.

Some measurements in millimeters of adults are: head and body length of males (sample size 22), range 300 to 381, mean 345, standard deviation 27, females (sample size 12), range 280 to 340, mean 315, standard deviation 19; length of the right humerus of males (sample size 37), range 41.2 to 51.3, mean 46.9, standard deviation 2.3, females (sample size 22), range 40.1 to 45.9, mean 42.8, standard deviation 2.1. Other measurements may be found in Lönnberg (1912), Schwarz (1935), and Smithers (1971). The lengths of the major limb bones of an East African adult male are: humerus 45, radius 34.6, ulna 42.0, metacarpal III 13.8, pelvis 44.5, femur 51.2, tibia 51.8, and metatarsal III 22.5. Limb proportions based on averages of five adult males are: humero-radial index 75, femoro-tibial index 103, tibio-radial index 66, intermembral index 78, humero-metacarpal index 32, and femoro-metatarsal index 44. Various other proportions were also given by Taylor (1971*b*). Mobility in the limbs in three freshly killed specimens was examined. The shoulder joint may be moved 110° in the anteroposterior plane, and has 20° radial deviation and 35° ulnar deviation. This is a much greater degree of flexibility than in *Herpestes ichneumon* and is correlated with the high agility of *H. sanguineus* (Taylor 1970, 1971*b*).

ECOLOGY. The black-tipped mongoose is primarily diurnal (Dücker, 1965), but may hunt by night when there is a moon and the weather is warm (Shortridge, 1934). Large raptors such as the African hawk eagle (*Aquila fasciata*) may prey on them, and the mongoose carefully watches and is particularly sensitive to birds flying overhead (Smithers, 1971). Man is probably the only significant predator, and then only when the mongoose kills domestic fowl. These mongooses are active predators. Rüppell (1835) wrote: "All *Herpestes* species live in earth holes in bushy areas. In the daytime they hunt small birds and rob nests. They also live on mice and are quite bloodthirsty" (translation). Shortridge (1934) mentioned a broader diet of "small rodents, birds, reptiles, eggs, insects, wild fruits and berries." Ewer (1968) also commented on the wide variety of this mongooses diet, an interpretation with which I concur after examining the contents of at least 30 stomachs.

Herpestes sanguineus is relatively ubiquitous and occurs with many other viverrids. It is also found with other diurnal species, although to what extent it competes for food or suitable resting sites has not been determined. In rocky hill and *Acacia* bush, it occurs (Sale and Taylor, 1970) with the genet (*Genetta tigrina*), white-tailed mongoose (*Ichneumia albicauda*), four-toed mongoose (*Bdeogale crassicauda*), and a mustelid, the zorilla (*Ictonyx striatus*).

Little is known of the population structure of this species. Thomas (1927) and Shortridge (1934) both observed that it travels singly or in pairs, and on two occasions I caught pairs in the same live trap. Home range may be as little as one km^2 (Taylor, 1970), but in desert areas with minimal cover, ranges are much larger. The animals may have some form of territory.

Roberts (1951) described the behavior of *Herpestes sanguineus* [*Myonax cauii swalius*] as follows: "Mr. Hare discovered it at Kobos basking every morning on the top of some large isolated boulders and was successful in eventually securing a male, but not the female which eluded him for several days and was not procured until I set a trap and caught it." This indicates that the animals may have held a territory, or at least occupied a particular place, in the area. The species is found in habitats from semidesert to thick woodland (Dücker, 1965). It does not seem to occur commonly in thick forests although Lönnberg (1912) found a subspecies in the Meru forest and Rosevear (1935) stated that it is found in the Cameroon forests. It was noted as absent from a Zambian floodplain (Sheppe and Osborne, 1971). The mongoose may be found in relatively desertic areas of the Pro-Namib desert (Coetzee, 1969) although it is probably completely absent from the extreme desert environment. One animal I caught near Lake Baringo, Kenya, died in a few hours in the trap, presumably from heat stress; some shelter is obviously necessary in hot regions. Old termite nests may be used for dens (Dücker, 1965). Shortridge (1934) noted that the animal lies up during the heat of the day, but he shot specimens at every hour between sunrise and sunset. *H. sanguineus* may live close to human dwellings (Smithers, 1971) and even occurs near the centers of large cities such as Nairobi (personal observation). It is also common in cultivated or formerly cultivated land (Lönnberg, 1912). Other than as a sporadic pest on poultry it has little obvious economic importance.

Pregnancy of the black-tipped mongoose occurs during the short rains (October and November) or during the long rains (February to April) in East Africa (Taylor, 1969). Smithers (1971) recorded a gravid female from Shorobe, Botswana, in December and two lactating females in February; also a female with foetuses in November from Rhodesia. There may be from two to four embryos (Hill, 1941; Shortridge, 1934; Smithers, 1966; Taylor, 1969, and Walker, 1964). J. Kingdon (1972, personal communication) observed a wild pair of *Herpestes sanguineus* that bred in a drain in Kampala, Uganda. The female was a rich pale red, the male melanistic, and the resultant young a uniform brown, half way between the two. The young are born in holes, rock-crevices, or hollows in trees and stumps (Maberly, 1960). No data are available for the length of the gestation period but it may be 60 to 70 days as in the Indian gray mongoose, *Herpestes edwardsi* (Frère, 1929).

Live traps (.6 by .3 by .3 m in size) were used successfully when baited with fresh meat or freshly killed birds. Shooting is possible, although rather inefficient.

Infections of *Rickettsia conori*, *R. akari*, and *R. burneti* were found in *Herpestes sanguineus* (Heisch *et al.*, 1962). The protozoan parasite *Babesia* sp. was recorded for *H. sanguineus* (Pierce, 1972). Four specimens examined for the presence of *Grahamella* were found to be free (Pierce, 1970). A species of helminth, *Rictularis myonacis*, was described from the small intestine of three specimens of *Herpestes sanguineus* (Ortlepp, 1961). Nematode worms of the metastrongylid genus *Filaroides* were found in large numbers in the lungs of a young *Herpestes sanguineus* (Sandground, 1937). Also the nematode *Travassopirura dentata* was reported from the esophagus and stomach of *H. sanguineus* [*Myonax cauii cauii*] by Monnig (1938). Two species of cestode, *Mathevotaenia herpestis* and *M. ichneumonitis*, also were found in this mongoose (Spasski, 1951).

Black-tipped mongooses may survive injuries; for example, out of 97 specimens, eight males and two females had skeletal injuries. These included fractures of the scapula, a complete break of the humerus, fractures of the radius and ulna, ilium, femoral shaft, tibia and fibula, and metatarsal III. One case of a displaced distal epiphysis of the femur was noted, probably this occurred when the animal was young. There is one example of a dislocation of the hind foot. One animal had its left mandible broken in two places. Fractures of caudal vertebrae were found in two animals (Taylor, 1971*a*).

BEHAVIOR. This agile mongoose is the only mongoose in East Africa to show any skill in arboreal climbing. It can run up and down wire netting, rough cut stone walls, branches, and the like, but does not appear to be a controlled climber (Taylor, 1970). On one occasion I saw a black-tipped mongoose climbing 20 feet up in a eucalyptus tree. Kingdon (personal communication) noted their arboreal tendencies and suggested that they may kill birds, which was also noted by Hinton and Dunn (1967).

"When running the body is held flat without arching. Characteristically, when caught in the open and running for cover, flips its tail into the vertical position" (Smithers, 1971). Taylor (1971*b*) assigned *H. sanguineus* into a general locomotory category of terrestrial walking and scrambling. "When excited, or on the defensive, erects the hair on the body and tail. When disturbed will freeze, standing motionless until the disturbance is located, or will rise on the back legs, balancing with or without the aid of the tail to obtain a better view" (Smithers, 1971). Individuals in captivity are mainly silent, but when young they frequently repeat a soft "huh nwe" (Smithers, 1971). Rüppell (1835) described the voice as a rather sharp monotonous whistle; I found this mongoose to be generally silent, although individuals will hiss when alarmed.

Some authors consider the species easily tamed (Rüppell, 1835; Dorst and Dandelot, 1970), whereas Cansdale (quoted in Hinton and Dunn, 1967) and I consider this difficult or impossible.

This mongoose utilizes a characteristic viverrid feeding behavior when tackling objects with a hard shell. I have observed that they are unable to bite open hen's or duck's eggs. Smithers (1971) noted: "Owing to the size of hens' eggs it was unable to break them with its teeth so, having manoeuvered them into a strategic position, would propel them between its back legs by flinging them with the front feet on to a rock or other hard object and so breaking them. This action was observed when the mongoose was given small stones, nuts, golf balls or other small objects to play with and would continue over considerable periods of time."

Rüppell (1835) stated that *H. sanguineus* roll up to sleep; no other authors have commented on sleeping posture.

Permanent nests or burrows do not appear to be used throughout the year, but convenient hollows are often used. A nesting site is generally a hollow tree, a rock crevice, or a hole (Dorst and Dandelot, 1970; Smithers, 1971; Hinton and Dunn, 1967; Shortridge, 1934; Kingdon, personal communication).

REMARKS. There have been numerous classifications proposed for this species. As early as 1907, Wroughton commented, "on *Mungos sanguineus*, a specimen from the hills near Suakin can, I believe, be nothing but a form intermediate between *M. gracilis* and *M. sanguineus*. . . . I think I am justified in concluding that *M. sanguineus* and *M. gracilis* cannot be specifically separated." More recently Dorst and Dandelot (1970) wrote: "There is a large range of intraspecific variation. Some authors distinguish several forms to which they give specific rank, like *cauui*, *ratlamuchi*, *ochraceus* and allies. They may be better considered as representing local races or color phases of a widespread species." Dr. D. J. Brand (personal communication) in Pretoria is working on the classification of the genus.

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